

Fish Fry Lake A Deeper Testimony to Using Natural Nutrients

By Bruce Kania

The idea of growing fish naturally was covered in the September/October, 2013 edition of *Pond Boss*. Bob Lusk gave us a historical review around this interesting topic as he responded to a reader's comment questioning the idea of feeding commercial fish food, Purina in this case, as a primary strategy for many of today's sport fishery ponds.

I really liked Bob's acknowledgment that a thoughtful pondmeister does not need to feed fish to have a terrific and productive pond, at least in settings where sufficient nutrients are already present in the water. Bob mentioned me in this article, and noted that figuring out how to cycle into our fish all the free nutrients from our friendly farming neighbors upstream is what we have been working on here at Fish Fry Lake in Montana. Bob also made a bunch of other excellent points, especially that anyone attempting this should really have their goal in hand before starting the process, because it truly is easy to lose sight of one's goal and get turned around along the way.

With this being said, here are a few other ideas that a new pondmeister might consider. Back in 1972, when the original Clean Water Act was passed at the federal level, between ten and twenty percent of lakes in the U.S. were eutrophied. Eutrophication is just a classification of lake nutrient status, but it means the lake is rich with nutrients. It also means that such a lake is likely to be very productive, but this comes with some risk in that a eutrophied lake can experience low levels of dissolved oxygen from time to time and is vulnerable to fish kills. Eutrophied water is risky water because it's on the brink of dying and toxic algae blooms and stinky water are on the horizon. But it's on today's menu, in that as the human population expands so does eutrophication. It seems like it can hardly be avoided. And



The underwater viewing window enables us to watch part of what goes on under water.

it's getting more so.

Today, some 41 years later, slightly over half of our lakes are now eutrophied. (This information comes from a recent EPA survey.) On the bright side, this means today about half of the lakes in the United States have excess nutrients available, sort of for free, to grow lots of fish as long as the lakes in question don't run out of dissolved oxygen along the way. Is this a problem or an opportunity?

Our number one goal here at Fish Fry Lake is to try to figure out how to grow fish instead of some of the other things that are poised to take advantage of the same free nutrients found in

eutrophied water. Last year we harvested 1,320 pounds of fish, mostly yellow perch, from Fish Fry Lake. We had been tracking our fish population, and found we could have harvested twice that number and still had sufficient breeders left, especially since we utilized a slot limit and returned the big spawners.

This year we are on track to harvest more than double last year's weight of fish from our 6.5-acre Fish Fry Lake. But perch catch rates have given way to bluegill, black crappie, and pumpkinseed. There are a few things going on here, like the fact that bluegills can spawn several times in a year and the perch don't seem to have gone





William Holt and Bruce Kania harvesting fish from Fish Fry Lake.

away; it's just that we can barely get a hook down to the perch without these other fish intercepting the bait. Last year our catch rate worked out to a bit over one fish every two minutes. This year's catch rate is nearly one fish a minute.

Bob mentioned phosphorus. This year's projected harvest of 2,700 pounds of fish translates to a bit over 26 pounds of it, and had this phosphorus not been harvested in the form of fish, it could have readily cycled into underwater plants

and algae, to the tune of 6,300 wet pounds of weeds per pound of phosphorus. This translates to 75 tons of potential weeds in our 6.5-acre pond. Had those weeds grown instead of fish, they would have ultimately died and decomposed and used up big volumes of dissolved oxygen. You can begin to see that growing and catching fish is a viable way to interrupt this downward spiral.

Now there's something really interesting about nutrients and it's a big deal—there is

a natural ratio of nutrients. A dude named Redfield figured this out some 55 years ago. He'd traveled the planet and measured nutrient ratios across the oceans. He discovered when it comes to the big three constituents of a living cell there is a common pattern in that there will be a ratio of about 106 carbon atoms, 16 nitrogen, and one phosphorus atom. So ask yourself these questions: What is likely to happen in your pond if the nutrient ratio in your water is skewed? What happens if your nutrient ratio is different than Redfield's?

The short answer is if your water is like ours here in Montana, skewed in favor of phosphorus, there is a life form poised to take advantage of such a deal. It's called cyanobacteria, a form of blue-green algae, but not a particularly friendly character. In fact, the toxins associated with Harmful Algae Blooms frequently derive from cyanobacteria. But what happens when your water's nutrient ratio is skewed towards nitrogen? Well that's a recipe for green algae. Sure, as long as you are poised to provide aeration when the bloom starts decomposing as it cycles through your pond, and as long as you can hit the right balance, it's a way to grow fish. But this reminds me of one of Bob's memorable lines from the first time we met, "You're not a fish farmer 'till you've had a fish kill." The idea of adding nutrients, like fertilizer (or fish food for that matter), is one of those choices you need to make up front because you are essentially adding nutrients, and you might not be adding the Redfield ratio.

Ok, so what happens when the nutrient ratio is just right? Well, there's a really interesting feature article in the June edition of Scientific American that answers this question. It describes how nature's been handling this for some 350 million years. The short answer is a form of phytoplankton called diatoms.

Diatoms have several unique things going for them. First, they are incredibly diverse and they can make a living in low light settings—think deep, deep water. This means they can make a living from top to bottom in a pond. When they occur as a component of periphyton, that sticky stuff that can show up on any surface area in your pond, then they appear to maintain a steady positive level of dissolved oxygen. There's one more thing though, this diatom-based periphyton really grows fish. By the way, periphyton is just a big word for the stuff that grows on any surface area under water. It tends to grow everywhere, like on your dock, the bottom of a boat, or any rocks, brush, or structure within water. This happens in salt water too. When there's enough of this stuff along with some circulation, the stage is set for water clarity, because the suspended solids that



This is a great way to introduce kids to fishing...and harvesting fish.

make water murky stick to the periphyton. This has something to do with what's called biofilm, but let's not go there right now. The key point is that water with lots of diatom based periphyton is really optimum for growing stuff such as protozoa, zooplankton, and countless other forms of invertebrates. Of course, this translates into natural food for fish. Think kelp beds or coral reefs out in the ocean, or structure in fresh water settings.

So let's say you are a budding pondmeister. As part of your diligence, ideally in advance of

building your pond if that's on the horizon, read up on this nutrient ratio topic and the Redfield ratio. Keep this in mind—if you build your pond just right, you can maximize for surface area. This sets the stage for improved water clarity, because of that biofilm/periphyton thing, which means that nature's motor, sunlight, isn't limiting your pond. And if you get it just right you won't have to compensate for a skewed nutrient ratio by constantly running aerators just to keep your fish alive.

As a quick wrap up, at Fish Fry Lake we are

looking at a harvest of a bit over 54 pounds of fish per acre foot of water, and there's no fish feeding involved. Our water clarity is currently around nine or ten feet, but it will be closer to twenty later this fall as the other forms of algae, which are still present, diminish with cold weather. While the other forms of algae, as in phytoplankton, are still here, we are slowly transitioning towards a diatom based periphyton food base. Scientists and engineers are telling me that I can take fish harvest up still further, if I'm willing to ride herd on the nutrient ratio, which in my case means adding some nitrogen to correct for the extra phosphorus in Fish Fry Lake's inflow. Even though I have a problem with the idea of adding nutrients of any kind to water, we are experimenting with this because our ultimate goal is to make sure the water leaving Fish Fry Lake is clean and healthy. If there are any nutrients in it, we want them to be at the Redfield ratio level—nature's balanced level.

There's another way to look at this, too. One time I had the pleasure of sitting down with Bruce Condello (think really BIG bluegills!) to just brainstorm about fish growth. I asked Bruce whether fed fish would outgrow wild fish in an optimum habitat. Bruce picked wild fish. When I asked him why, he suggested that wild fish in an ideal habitat have everything they need for optimal growth. At the time, I wasn't sure Bruce was right. I couldn't imagine that a kept animal, a fish almost being force fed, so to speak, wouldn't outgrow anything in the wild. But now I'm not so sure.

To wrap up, remember Bob's point about having your goal really nailed? Here at Fish Fry Lake we are trying to understand how to clean up the water, and we are getting there. Our water is getting cleaner and cleaner. And FISH seem to be the pathway. They happen to be a terrific way to cycle nutrients out of water. In the process, water that leaves Fish Fry Lake isn't messing with my neighbors downstream. You know that "Oh Brother, Where Art Thou?" thing! What I find really surprising about what we've learned is there are other outcomes too, and they are a blast. For example, we now have a form of fresh water sponge in Fish Fry Lake. Don't ask me where it came from or how it got here. Until a month ago, I didn't know there was such an animal in fresh water. It's a filter feeder, so it's contributing to our goal of clean water. We are also now maintaining healthy dissolved oxygen levels top to bottom thanks to diatom-based periphyton. All this is really fun stuff, and even though it may seem a bit technical to a budding pondmeister, the process of being around a waterway and stewarding it, guiding it, towards health is a blast!

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